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June 1965

PHOTOGRAPHIC INTERPRETATION REPORT

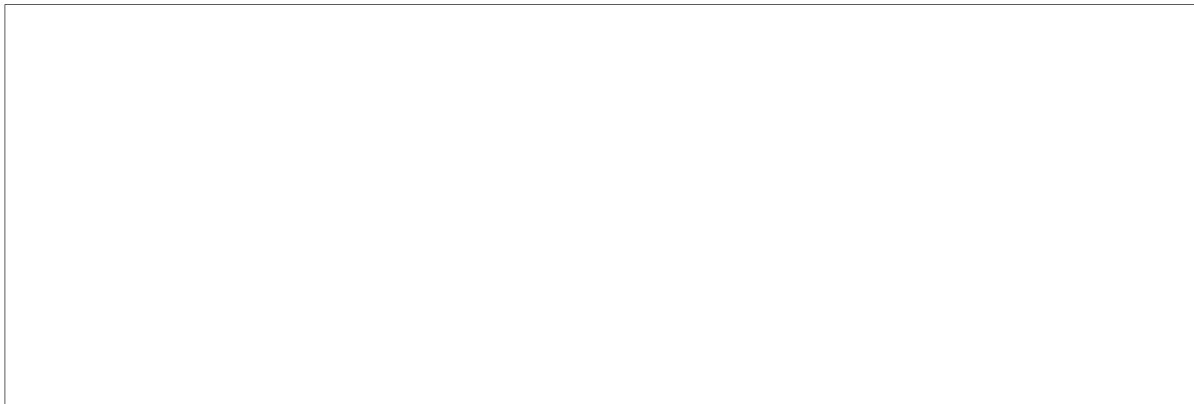
SPHERICAL CURTAIN ANTENNA ARRAY FACILITIES PODOLSK AND ODESSA, USSR



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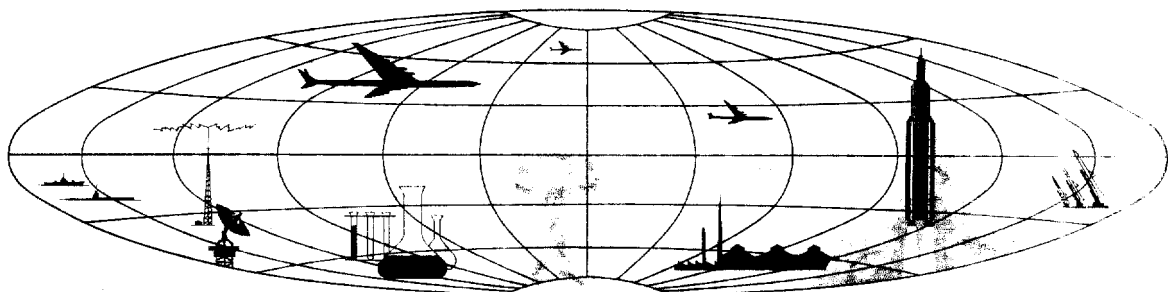


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SPHERICAL CURTAIN ANTENNA ARRAY FACILITIES PODOLSK AND ODESSA, USSR

INTRODUCTION

An examination of photography [] has revealed a new antenna installation at Podolsk, approximately 24 nautical miles (nm) south-southwest of Moscow (Figure 1). Subsequent analysis has shown that the antenna array at this facility has a configuration similar to but smaller than the spherical curtain antenna arrays previously reported at Taldom and Nikolayev. 1/ On photography of [] an additional in-

stallation--situated near Odessa and in the early stages of construction--was noted to bear a strong resemblance to the one at Podolsk.

This report presents a detailed photographic analysis of the facility at Podolsk and a more concise description of the facility under construction near Odessa; it then very briefly summarizes, for the convenience of the reader, the previously published comprehensive analysis of the Taldom-Nikolayev arrays; 1/ it concludes with a comparison of the antenna arrays themselves.

Associated Krug Sites

A Krug high-frequency direction-finding (HF DF) site, just to the north of the Podolsk facility (Figure 2), was noted during the original scan but was not at first thought to be of any particular significance. However, when it was subsequently observed that the Odessa facility also had a Krug site situated in its immediately vicinity (Figure 4), and that in both instances the new facilities apparently shared a common support area with the Krug site, then these collocations assumed additional importance and the new facilities are now considered to be associated with the Krug sites.

PODOLSK FACILITY

The HF spherical curtain antenna array facility at Podolsk (55-22-20N 37-27-50E) is surrounded by a low, pentagon-shaped wall measuring 780 feet on each side and apparently constructed in a dike shape (Figures 2 and 3). Podolsk Krug DF Site Klimovsk [] is 5,875 feet north, and a probable support area is approximately 5,000 feet northeast; indications are that the probable support area serves

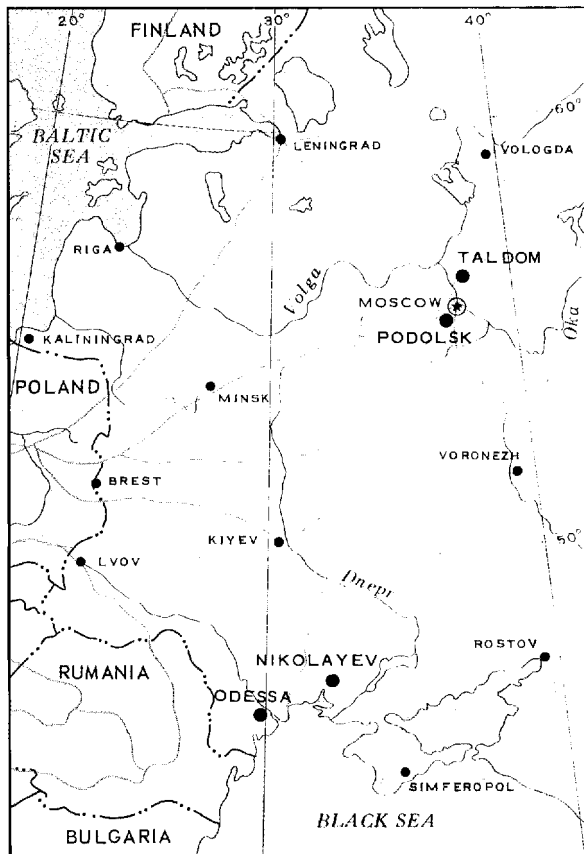


FIGURE 1. LOCATION OF ANTENNA FACILITIES.



FIGURE 2. SPHERICAL CURTAIN ANTENNA ARRAY AND PROBABLY ASSOCIATED FACILITIES, PODOLSK.

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both installations.

Inside the walled area of the facility are 3 probably self-supporting lattice-type towers (Figure 3, items A, B, and C), each 130 feet high, with 14 thin masts, also 130 feet high, uniformly spaced 65 feet apart in 2 slight arcs between the lattice-type towers. The small scale of the photography precludes positive evidence of tower or mast guying, or of the design of any complex

rigging between the towers and masts. There is also a probable footing for another tower (item D), but no sign of any masts between there and Tower C.

Probable self-supporting feed towers (items E and F) are positioned opposite each arc on a 2-rail track laid out parallel to lines drawn between the 3 towers, A to B and B to C. The calculated ratio of (1) the distance from the probable feed

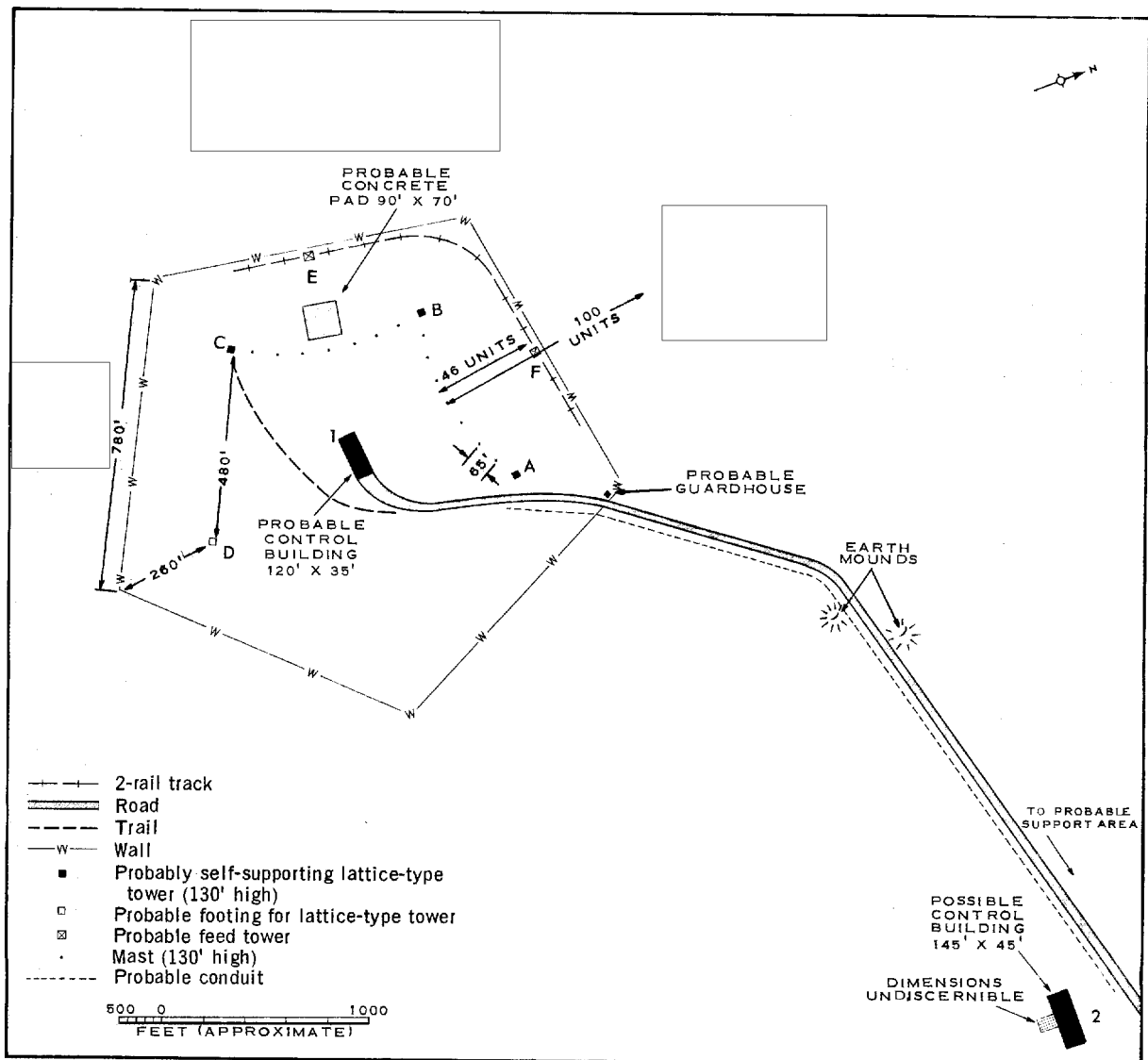


FIGURE 3. LAYOUT OF ANTENNA ARRAY FACILITY, PODOLSK.

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tower to the center arc-mast and (2) the assumed radius of a circle formed by the arc of masts, is 46:100, or 46 percent.

The orientation of the array between Towers A and B is [redacted] of that between Towers B and C it is [redacted] and if an array were placed between C and D, its orientation would be [redacted]

Immediately west of a line between Towers B and C is a probable concrete pad measuring 90 by 70 feet. A probable control building (item 1), 120 by 35 feet, is in the approximate center of the walled area; the shadow cast by this building indicates that the eastern portion of the building is higher than the rest. Approximately 2,350 feet east-northeast of Building 1 is a T-shaped building (item 2) which is possibly another control building for the antenna system. The main section of this second building measures 145 by 45 feet, but mensuration could not be accomplished on the wing because of poor building-corner definition. A probable conduit parallels the road into the facility but its exact origin or terminus cannot be definitely established from available photography. Also, on each side of the approach road approximately 1,330 feet northeast of Building 1 there is an earth mound supporting an unidentified object.

ODESSA FACILITY

The probable HF spherical curtain antenna array facility near Odessa (Figure 4) is situated at 46-26-30N 30-30-00E, approximately 2,400 feet north of Odessa Krug DF Site No 1 [redacted] and about 8 nm west of Odessa. The facility is in the early stages of construction, with no towers, masts, or antennas yet visible. However, although no absolute statements concerning intended configuration can be made, all available data and appearances strongly suggest that, when com-

pleted, this facility will be similar to the one at Podolsk. Presently possible mensuration is shown in Figure 4, together with likely future antenna orientations. This facility also has a probable central control building similar to that at Podolsk both in dimensions and configuration (i.e., in having a raised section at 1 end of the roof). Approximately 1,500 feet to the northeast is a support area and HF communications site, which probably serves both the Krug site and the antenna facility.

TALDOM-NIKOLAYEV FACILITIES

Six antennas of an unusual configuration (spherical curtain array) were noted some while ago at broadcast/communications facilities near Taldom and Nikolayev (Figure 1). These antennas, of which the larger and more complex Taldom facility has 4 and the smaller Nikolayev facility only 2, consist basically of either 9 or 13 guyed towers arranged in a slight arc that faces a self-supporting feed tower which is either fixed or mounted on a low gantry-like structure on a 2-rail track laid out parallel to a line drawn between the end towers of the arc (the longest chord). These general characteristics are shown in the upper portion of Figure 5 (which is re-run intact from the earlier report, NPIC/R-901, 1/ and happens to illustrate a 13-tower array, of which there are 2 as compared to 4 -- 3 at Taldom and 1 at Nikolayev -- having 9 towers).

COMPARISON OF ANTENNA ARRAYS

As shown graphically in Figure 5, the Taldom-Nikolayev arrays (top) and the Podolsk arrays (bottom) have a striking resemblance (the Odessa facility is not yet far enough advanced in its construction to be considered further). More specifically, it can be pointed

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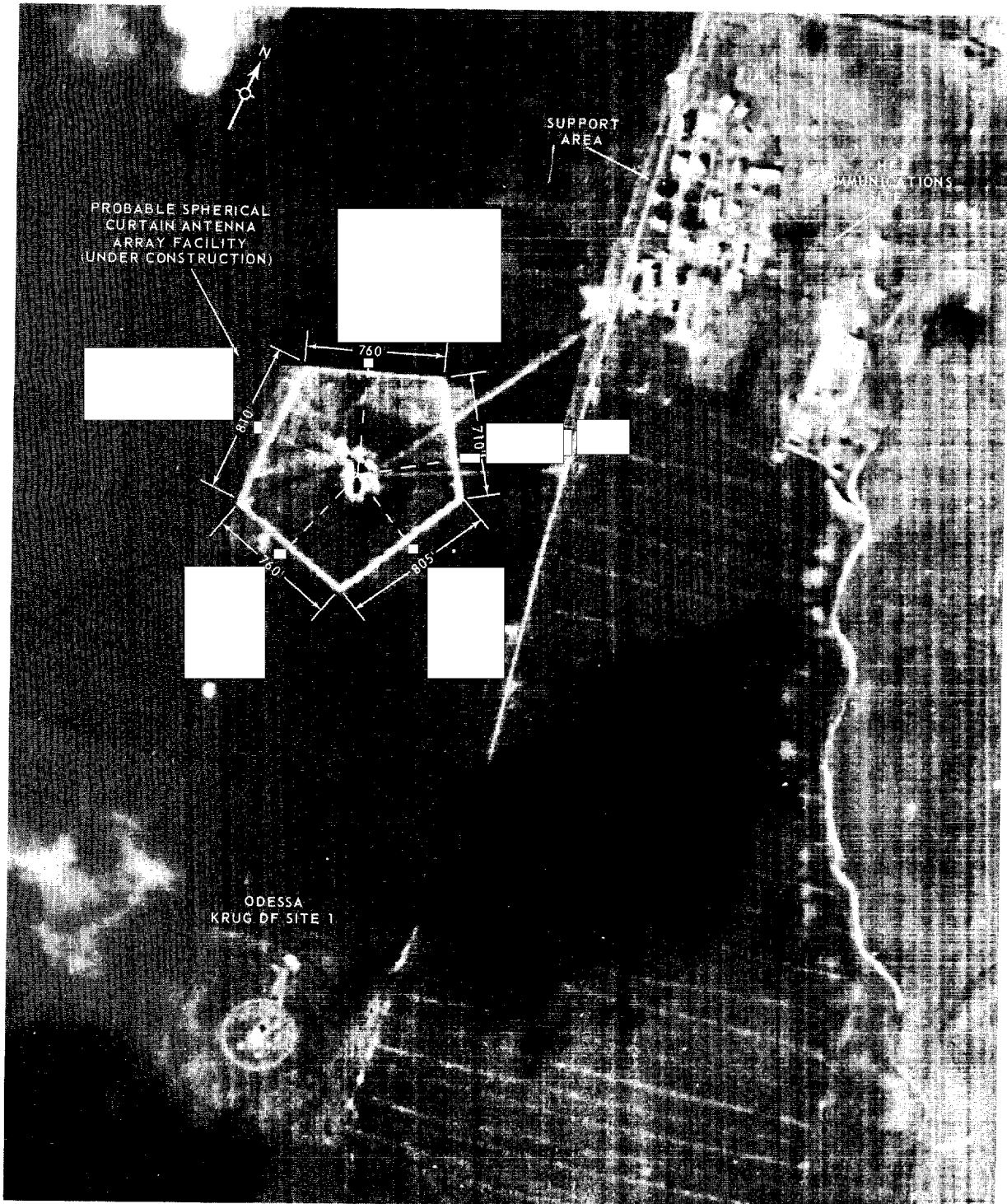


FIGURE 4. PROBABLE SPHERICAL CURTAIN ANTENNA ARRAY (UNDER CONSTRUCTION) AND ASSOCIATED FACILITIES, ODESSA.

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out that the Podolsk arrays contain exactly the same number of towers/masts as 4 of the 6 Taldom-Nikolayev arrays, and that in all cases, the towers/masts are laid out in a slight arc. Although the assumed radius

of this arc is naturally smaller at Podolsk, nevertheless the calculated ratio of the radius and of the feed tower to center arc tower/mast distance remains approximately 46 units to 100 units in all cases.

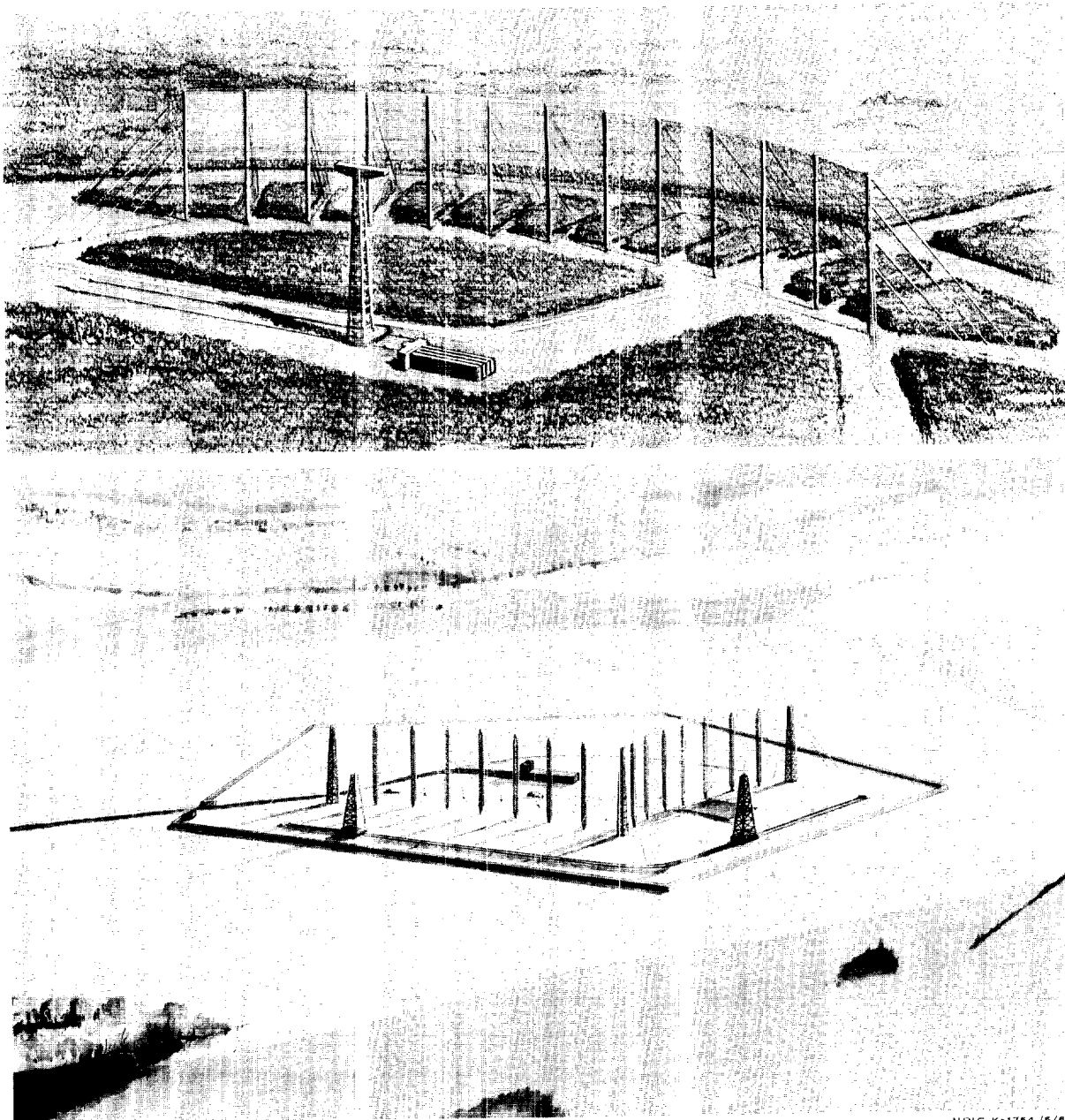


FIGURE 5. PERSPECTIVE VIEWS OF SPHERICAL CURTAIN ANTENNA ARRAYS. (NOTE: both drawings are not at same scale.)

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As has been mentioned, the Taldom-Nikolayev antennas are larger in actual measurements. But, as shown in Table 1, the Podolsk arrays equate almost exactly to one third of several significant Taldom-Nikolayev dimensions, namely the separation distance between individual towers/masts in the arc, the height of these towers/masts, and the longest-chord distance between end towers.

The most noticeable difference found in a detailed photographic observation of these arrays was that the end towers at Podolsk appear considerably larger in cross section than those at Taldom-Nikolayev. A possible explanation for this may be that less extensive guying is used on the smaller Podolsk arrays than is required for the larger Taldom-Nikolayev arrays.

In regard to frequency, it is believed that the antenna arrays at Taldom-Nikolayev are designed to operate in the HF range, a conclusion suggested by their overall appearance

and arrangement, and by the apparent large size of both illumination (feed source) and antenna aperture. 1/ Even though the Podolsk facility is smaller, it would still appear likely that it also operates within the HF band, though possibly with a somewhat higher range than the Taldom-Nikolayev arrays.

Table 1. Comparative Mensural Data

	Antenna Location	Masts/Towers in Arc			Longest Chord* (ft)
		Num-ber	Separation (ft, aver)	Height (ft)	
	Taldom (1)**	9		330	1,475
	Taldom (3)**	9		395	1,470
	Taldom (4)**	9		330	1,485
	Nikolayev (5)**	9		320	1,435
AVERAGE		9			
ONE-THIRD AVERAGE	Taldom-Nikolayev	--	65	115	
	Podolsk (A-B)	9	65	130	480
	Podolsk (B-C)	9	65	130	480

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*Straight-line distance between end towers.

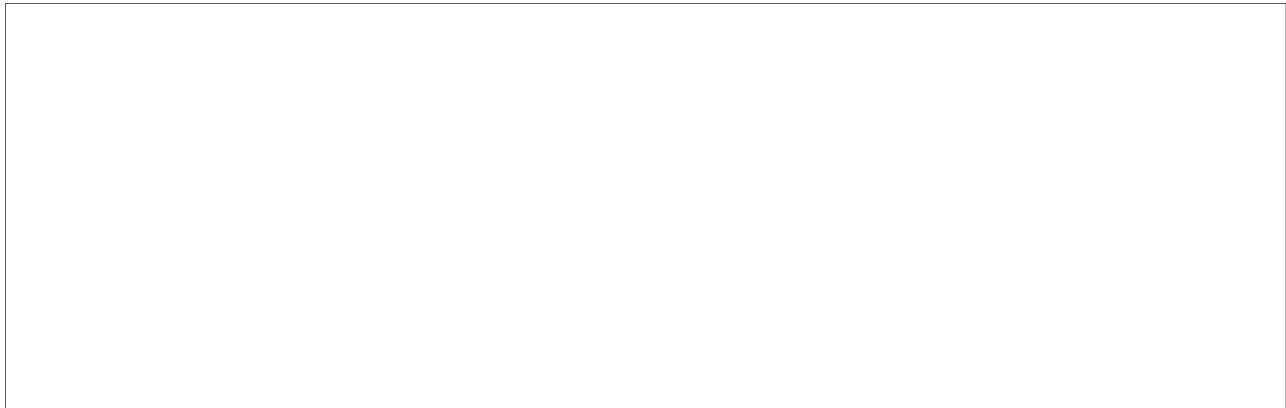
**Refers to numbering used in previous report. 1/

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REFERENCES



MAPS OR CHARTS

Podolsk

DIA. US Air Target Chart, Series 200, Sheet 0167-5HL, 2d ed, Apr 33, scale 1:200,00 (SECRET)

Odessa

SAC. US Air Target Chart, Series 200, Sheet 0250-8HL, 3d ed, Sep 62, scale 1:200,000 (SECRET)

DOCUMENT

1. NPIC. R-901/64, *Unusually Configured Antennas at Facilities Near Tablom and Nikolayev*, Oct 64 (TOP SECRET RUFF)

REQUIREMENT



NPIC PROJECT

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